Space Weather Forecast

Issued on Thursday 2 January 2025 at 01:06 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate class flares expected, with a slight chance Strong-class flares. Chance G1 Minor Storms day 3 (04 Jan) from glancing coronal mass ejections and onset of fast solar winds.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with four Moderate class flares observed, all small, but with the largest form the region on the northwest limb. This is the most active of the thirteen sunspot regions on the disc, but is now impossible to analyse due to its location. Significant growth was observed in a number of regions, including a new region in the southwest, along with two in the southeast, however these remain relatively simple with their magnetic structure. A further region in the southwest, is perhaps the most complex of the other regions on the disc, but remains relatively small with no significant flaring in the last 24 hours. Some notable magnetic looping is also evident on the northeast limb, which may suggest a further region to move onto the disc.

A weak CME (coronal mass ejection) was observed from near the more complex southwest region at 01/0130 and has been assessed as potentially giving a glancing impact on day 3 (04 Jan). The other observed eruptions are off the Earth-Sun line.

Solar Wind / Geomagnetic Activity: Ongoing CME influence at first, was followed by the arrival of a second CME enhancement, potentially around 01/0320 UTC. Solar winds increased from slightly elevated, 450km/s, at 01/0320 UTC to be elevated at 500-550 km/s by 01/0600 UTC, and then persisted largely at this level. Total Interplanetary Magnetic Field (IMF), was Moderate-to Strong until 01/1830 UTC, and persistently Strong between 01/0900-01/1715 UTC. This then eased to be weak by midnight. The north-south component was generally weak to moderate southward at first, with brief moderate northward spells, but became persistently strongly southward between 01/1030-1620 UTC. Geomagnetic activity was Active to G2 Moderate Storm, with one G4 Severe Storm interval reported by BGS at 01/1500-1800 UTC with aurora observed across the northernmost parts of the UK.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background with no Solar Radiation Storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is expected to continue with occasional Moderate class flares. There remains a slight chance of isolated Strong-class flares. This is despite the main active

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sunspot region soon rotating off the visible disc, due to some sunspot growth being observed, and further regions potentially rotating onto it.

Solar Wind / Geomagnetic Activity: There is one potential Earth-glancing CME, from an eruption near AR3939 early on 01 Jan, likely passing Earth on day 3 (04 Jan). However this is low confidence. Solar winds are currently elevated, but likely to ease as recent CME enhancements continue to wane. The next enhancement is likely to be from the onset of fast winds from the larger and northern of the two coronal holes on the disc, also on day 3 (04 Jan). Mainly Quiet to Unsettled geomagnetic activity is expected at first, with a slight chance of Active intervals from any ongoing CME influence. Fast winds, and the CME arrival are likely to increase activity to Active to G1 Minor Storm on day 3, easing day 4 (04-05 Jan).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to persist at background with only a slight chance of Solar Radiation Storms occurring.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	5	5	40	20
Strong	G3	Yes	1	1	1	1
Severe	G4	Yes	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	Yes	80	80	80	80
Very Active	R3-R5 (X Class)	No	15	15	10	10

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Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	20	20	15	15
Very Active	**≥ S3 ***	No	5	5	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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